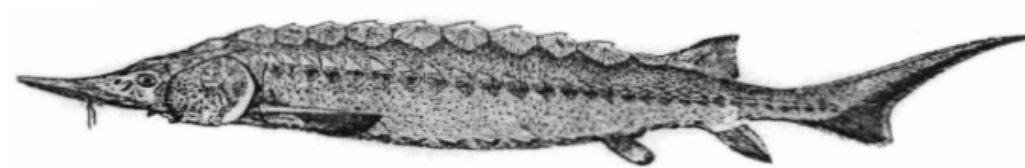


Title:	Sturgeon Reproductive Strategies
Subject:	Population Ecology
Author:	Rob Yeomans
Time Duration:	One 90 minute block
Overview:	Students will be able to identify sturgeon's survivorship curve and parental care strategy.
Objectives:	<p>Students will be able to explain:</p> <ul style="list-style-type: none"> • Sturgeon reproduction • Survivorship curves • R/K strategies • graphs (MCAS focused)
Background Knowledge:	Students should have a background in ecology, preferably population ecology, niches and habitats.
Materials:	Student worksheet
Procedures:	Pass out the worksheet and have the students read the introduction. When finished, ask if students have any questions. Then, in groups of two, have the students use the graph to answer the questions. Once the class has finished, project the graph onto the board. Have the students answer the questions and go over them with the class.
Conclusions:	For homework, students are to explain which parental strategy is better. They must explain their choice in a half a page. Responses should be discussed for a short time at the start of the next class.
Massachusetts Frameworks	<p>High School Biology</p> <p>6.1 Explain how birth, death, immigration, and emigration influence population size.</p> <p>6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.</p>



Marine Biology

Sturgeon Reproduction and Population Ecology



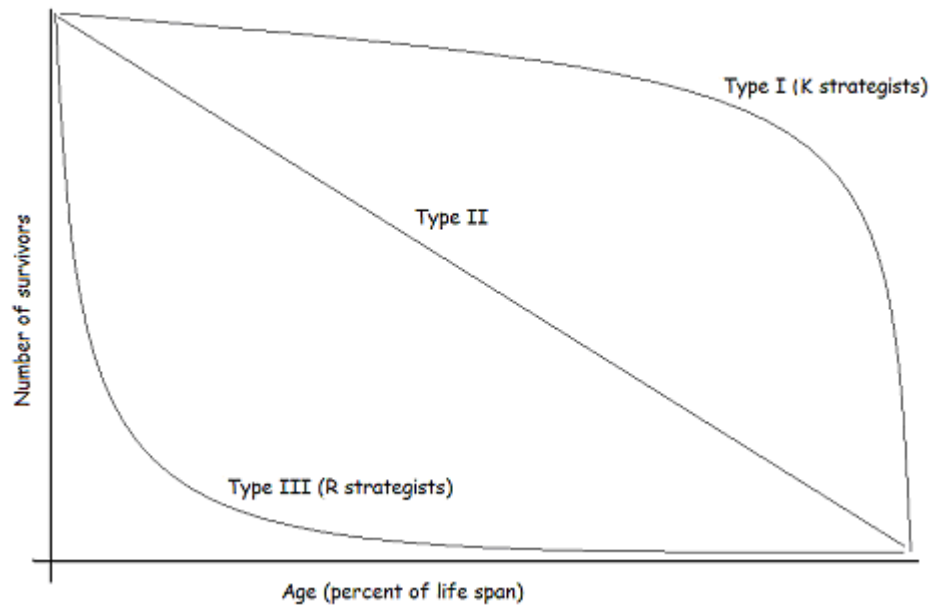
Introduction

Sturgeon are an anadromous fish species that inhabit rivers, estuaries and the ocean at various stages during their life cycle—and their lifecycle is a long one. Adults can live up to 80 years. After spending up to 3 years in their natal rivers as juveniles, they travel into the oceans until they reach sexual maturity. This may take another 8-20 years, depending on the sex of the fish (females usually take longer to reach sexual maturity) and latitude (sturgeon in the northern rivers generally take longer to reach sexual maturity).

Spawning typically occurs in the in the springtime. Both sexes swim back up their natal rivers to the spawning grounds. Females lay their eggs, which are sticky, and attach to the river's gravel bottom—larger females have been known to lay 800,000 to 3.5 million eggs. The males then fertilize the eggs with milt. The adults leave the eggs to the mercy of the river and their well chosen spawning grounds. Of that egg mass, only 10% will survive to reproduce in the natal river again. The rest die due to predation, water pollution or a menagerie of other causes.

Survivorship Curves

Below is a graph depicting the three survivorship curves and the names of two parental care strategies commonly found in nature. A survivorship curve illustrates the numbers in a population over the course of time. A strategy depicts how parents care for their offspring.



Questions:

Use the survivorship curves and the background information on sturgeon from the introduction to answer the following questions.

1. Which survivorship type do sturgeon employ? Explain your answer.
2. List three other organisms that exhibit the same strategy as sturgeon.
3. What would be two benefits of this type of parental strategy?

The next set of questions (4-6) describes the survivorship curve OPPOSITE sturgeon.

4. Which survivorship curve is opposite the sturgeons'? Explain what is happening with this survivorship type.
5. List three organisms that exhibit this parental care strategy.

6. What would be two benefits of this type of parental strategy?

The next set of questions (7-10) compares all three survivorship curves

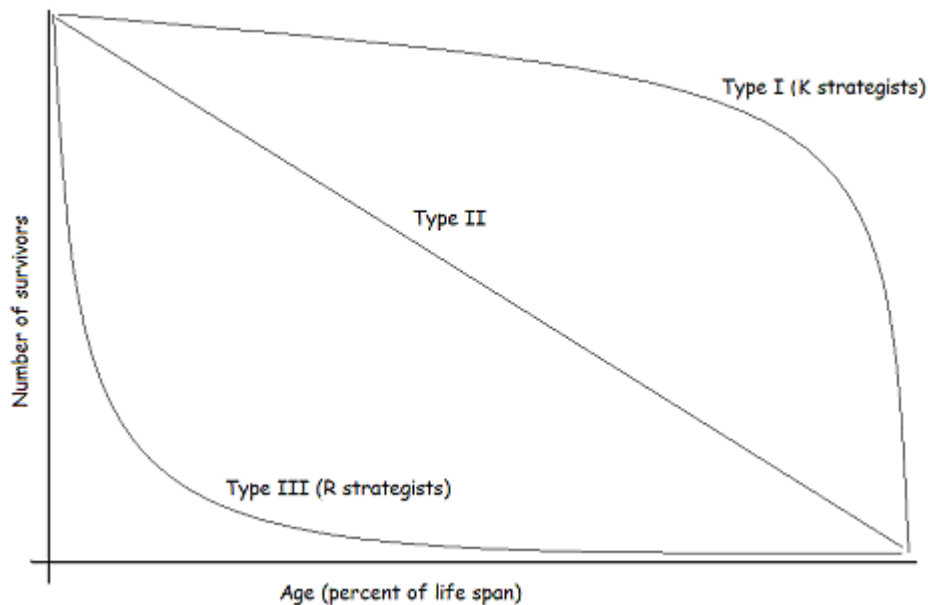
7. Explain where the reproductive energy is focused for each type of parental care strategy.

8. Which type survives best in a crowded ecological niche? Less crowded niche? Explain your answers.

9. There is one survivorship curve that is not employed by sturgeon nor is it the direct opposite curve. Explain what is happening with organisms in this type. What organism would be an example of this type?

10. Some ecologists have dismissed the terms “R” and “K” and have replaced them with the terms “maintenance” and “dispersal.” Match the new terms to the old terms and explain how they are accurately used.

Teacher Answer Key



Questions:

Use the survivorship curves and the background information on sturgeon from the introduction to answer the following questions.

1. Which survivorship type do sturgeon employ? Explain your answer.

Sturgeon employ the Type III survivorship curve, because out of the millions of eggs the female lays, only 10% will survive to reproduce in the future. That would cause the survivorship curve to drop.

2. List three other organisms that exhibit the same strategy as sturgeon.

Possible Answers: Plants, oysters, sea urchins

3. What would be two benefits of this type of parental strategy?

When you produce so many eggs, it provides protection from predators and the elements since there are so many. It also ensures that at least some of the eggs will survive.

The next set of questions (4-6) describes the survivorship curve OPPOSITE sturgeon.

4. Which survivorship curve is opposite the sturgeons'? Explain what is happening with this survivorship type.

The curve that is the opposite of the sturgeons' is the Type I survivorship curve. There are few young with a high survival rate, they live long and eventually die in their old age.

5. List three organisms that exhibit this parental care strategy.

Possible Answers: Humans, whales, some bird species

6. What would be two benefits of this type of parental strategy?

Your offspring will live a long time. There is less competition for food/habitat among siblings.

The next set of questions (7-10) compares all three survivorship curves

7. Explain where the reproductive energy is focused for each type of parental care strategy.

For Type I, the reproductive energy is focused mostly in the middle of the curve, because the organism raises, nurtures and protects their young. For Type II, the reproductive focus is in the beginning of the curve. While they may nurture and raise their young in the beginning, their offspring still tend to die off at a constant rate. For the Type III curve, the reproductive energy is also focused at the beginning of the curve. The organism produces their young and leave the offspring to tend to themselves.

8. Which type survives best in a crowded ecological niche? Less crowded niche? Explain your answers.

Type III would do best in a crowded ecological niche, since the population is already so few, there would be more of a chance for predators to prey on the bigger population of organisms. Type I would do better in the less crowded niche, because there would be less competition for food/habitat with other organisms.

9. There is one survivorship curve that is not employed by sturgeon nor is it the direct opposite curve. Explain what is happening with organisms in this type. What organism would be an example of this type?

Type II are for species that have a relatively constant death rate throughout their lifespan. Possible examples: coral, squirrels, honey bees, and many reptile species.

10. Some ecologists have dismissed the terms “R” and “K” and have replaced them with the terms “maintenance” and “dispersal.” Match the new terms to the old terms and explain how they are accurately used.

“R” refers to the “dispersal” curve which is Type III. The organism is producing the young, and then dispersing them. “K” is the “maintenance” curve which is Type I. The organism produces the young and maintains their livelihood.